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Synchrotron Light Source

Ion Motion in an Undulator, Y.H. CHIN, Lawrence Berkeley Laboratory*--In storage rings utilizing electron (as opposed to positron) beams, trapping of positive ions in the potential well of the beam can cause a degradation of electron beam lifetime and lead to beam instabilities. This latter problem must particularly be avoided in high-brightness synchrotron light sources to maintain a low effective emittance. In light sources optimized for insertion devices, ions tend to be trapped by the magnetic bottle of undulator fields via the mechanism of magnetic mirror confinement of the plasma. Computer simulations have been done to study ion motion in undulators including the space-charge forces from the circulating electron beam. The results indicate that the space-charge force is so strong (the resulting change in ion velocity is of the order of the thermal velocity) that the final position of an ion after a thousand turns is very sensitive to its initial position. Some preliminary results of the simulations and their interpretation are presented.

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Send to:
W.W. Havens, Jr.
Executive Secretary
American Physical Society
335 East 45th Street
New York, NY 10017

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Signature (APS Member)

Yong Ho Chin
Name Typewritten
MS/47-112
Lawrence Berkeley Laboratory
1Cyclotron Road
Berkeley, CA 94720
Address